UNIVERSITY AVENUE BRIDGE
Pennsylvania Historic Bridges Recording Project - II
Spanning Schuylkill River at University Ave. (State Rt. 3003)
Philadelphia
Philadelphia County
Pennsylvania

HAER No. PA-503

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C Street, NW
Washington, DC 20240

HAER
PA
51-PHILA,
730-

HISTORIC AMERICAN ENGINEERING RECORD

UNIVERSITY AVENUE BRIDGE

HAER No. PA-503

Location:	Spanning Schuylkill River at University Ave. (State Rt. 3003), Philadelphia, Philadelphia County, Pennsylvania.
USGS Quadrangle:	Philadelphia, Pennsylvania-New Jersey (7.5-minute series, 1994).
UTM Coordinates:	18/483198/4421276
Dates of Construction:	1927-33.
Designers:	John A. Vogelson, Chief Engineer, and Steven H. Noyes, Bridge Engineer, Philadelphia Department of Public Works; Paul Philippe Cret, consulting architect.
Builder:	Dravo Contracting Company (Pittsburgh).
Present Owner:	City of Philadelphia.
Present Use:	Vehicular and pedestrian bridge.
Significance:	The University Avenue Bridge is significant for its association with noted Philadelphia architect Paul Philippe Cret, who designed the bridge in collaboration with city engineers. Its exterior treatment reflects Cret's stripped-down classicism, in accordance with his Beaux-Arts training and the prevailing City Beautiful movement for enlightened civic architecture. The structure is also significant as one of a declining number of movable bridges in Philadelphia. In May 1994, the University Avenue Bridge was listed in the National Register of Historic Places.
Historian:	Helen P. Ross, August 1998. Revised and expanded by Justin M. Spivey, March 2001.
Project Description:	The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and

State Historic Preservation Officer. The fieldwork, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

Introduction

The University Avenue Bridge is significant for both form and function. Its architectural treatment, a stripped-down classicism known as the Moderne style, is the work of noted Philadelphia architect Paul Philippe Cret. This refined exterior conceals the mechanical and electrical systems of a double-leaf simple-trunnion bascule bridge that allows shipping traffic to pass on the Schuylkill River. Designed by city engineers John A. Vogelson and Stephen H. Noyes, the structure is one of few movable bridges in Philadelphia. The bridge was built late in the City Beautiful movement, an era of unprecedented municipal improvement during the early decades of the twentieth century. This remarkable structure represents the height of collaboration between engineering and architectural disciplines in Philadelphia, when an enlightened Department of Public Works asserted itself as a leader in constructing bridges of distinction.

Spanning the Schuylkill River southwest of Philadelphia's central business district, the University Avenue Bridge site was seen by civic boosters as a potential gateway to the city. This vision influenced the monumental nature of the bridge's design, despite its location in a predominantly industrial area. The majority of Philadelphia's maritime and industrial activities occurred along the wider and deeper Delaware River, but the Schuylkill had always served as an important secondary port. Burgeoning residential neighborhoods were located immediately inland from either waterfront. During the early decades of the twentieth century, the city sought to improve transportation links across the Schuylkill in conjunction with civic and institutional expansion on the west bank of the river. A bridge along the line of 34th Street would connect South Philadelphia to the University of Pennsylvania campus, a new convention center, and the proposed 30th Street Station. Evidently deciding that "34th Street Bridge" was not lofty enough, city officials called the structure University Bridge. Its name grew to University Avenue Bridge once it was connected to University Avenue, a parkway subsequently built through the campus.[1]

Description

The University Avenue Bridge is one of Philadelphia's few remaining movable bridges, spanning a portion of the Schuylkill River still active with industrial shipping. It carries four lanes of University Avenue (State Route 3003) and two sidewalks between South 34th Street in

---

[1] John Bowie, ed., *Workshop of the World: A Selective Guide to the Industrial Archeology of Philadelphia* (Wallingford, Pa.: Oliver Evans Press, 1990), 11-5; Michael J. Steffe, "University Avenue Bridge," Philadelphia County, Pennsylvania, National Register of Historic Places Registration Form, 1994, Section 8, pp. 3-4, U.S. Department of the Interior, National Park Service, Washington, D.C.

the Grays Ferry neighborhood and the University of Pennsylvania campus on the west bank, with ramps connecting to the westbound Schuylkill Expressway (I-76). The bridge provides a clear channel of 100'-0", with a vertical clearance of 30'-0" when closed. It is the city's northernmost operable drawbridge, since the South Street Bridge has been welded shut. Its double-leaf simple-trunnion bascule span currently opens on average once per day to accommodate tug boats pushing barges to and from fuel docks upriver.[2] The relative lack of movable bridges can be explained by Philadelphia's geography. Chicago, Milwaukee, and other port cities presently retain significant populations of movable bridges because their central business districts coincide with the mouth of a navigable river. Downtown Philadelphia, in contrast, sits between two rivers. Along the primarily industrial waterfront to the southwest, inexpensive land could be acquired for approaches to high-level crossings at Grays Ferry, Passayunk, and Penrose avenues, which have replaced low-level structures during the later twentieth century.[3]

Around the turn of the twentieth century, city engineers in Chicago and Milwaukee developed the simple-trunnion bascule design as an alternative to clumsy swing spans and expensive patented movable bridge types. The simple-trunnion bascule consists of a movable leaf rotating about a stationary horizontal axis at the abutment. The roadway is carried by two or more lines of trusses or girders, with short axles (called trunnions) beneath each truss or girder. On the other side of the trunnions, a fixed counterweight balances the leaf. Most bridges of this type have operating machinery located below the deck in the abutments, with electric motors providing smooth operation.[4] Because the Chicago-type bascule design was not protected by patent, it was subsequently exported to other cities such as Portland and, much later, Philadelphia.

On the University Avenue Bridge, four lines of heavy riveted plate girders support each leaf. Plate-girder floor beams and rolled I-beam stringers originally carried a deck paved with wooden blocks, although this has since been replaced with a concrete-filled open steel grid. The main girders are 60'-1" long and tapered from trunnion to tip. Their transverse spacing is 28'-8", 10'-0", and 28'-8" on center, with the narrower middle spacing providing additional strength intended to support streetcar tracks, which were never installed.[5] The entire girder sits above the trunnion, which is mounted to its bottom flange. The girders extend past the trunnions to support counterweight boxes, which later investigation revealed were filled with pig iron and steel scrap,

---

[2] Alan Sipress, "Last of a Breed of Bridge Workers," *Philadelphia Inquirer,* 2 Dec. 1992.

[3] Steffe, "University Avenue Bridge," Section 8, p. 4.

[4] Donald C. Jackson, *Great American Bridges and Dams* (Washington, D.C.: Preservation Press, 1988), 31-32, 197.

[5] City of Philadelphia, Department of Public Works, Bridge Division, "University Bridge over the Schuylkill River: General Plan," Drawing No. 12210 (Dec. 1926); ibid., "... Steel Plan of Bascule Span," Drawing No. 12226 (Feb. 1927), both in Compartment No. 1278, Department of Streets, Bridge Section .

bonded together with concrete.[6] To stop the upward motion of the leaf, hooks on the bottom of the counterweights engage bumpers anchored by eye-bars into the piers. Decorative bronze hoops hang on the face of the pier, emphasizing the locations of the bumpers.

The bridge's operating machinery consists of two electric motors in each pier. The motors turn four sets of reduction gears linked to either end of a transverse shaft. Resistance brakes control the motor speed during normal operation, and are supplemented by an emergency friction brake located between the second and third reduction. Hand wheels are linked by a chain-and-sprocket drive to the first reduction gear for emergency operation. To rotate the leaves, pinions mounted on the transverse shaft engage cast steel racks on the curved heel of each leaf girder. The racks have a pitch diameter of 15'-0". When the leaves are open, their entire weight bears on the trunnions, which are supported by heavy plate girders running across the piers. In the closed position, each leaf rests on another transverse girder placed in front of the trunnion girder, which absorbs the weight and impact of traffic. The leaves are locked together to form a continuous structure by four latches driven by electric motors at the tip of the south leaf. Plans also show two electric motor-driven latches at the heel of each leaf. The rear latches are necessary because the floor breaks behind the trunnion, where the weight of traffic could tip the leaf open.[7]

The bascule span is flanked by two deck girder approach spans on either side, bringing the bridge's total length to 536'-0". From face of abutment to face of bascule pier, the approaches measure 188'-0", divided into two equal spans by an intermediate pier. Cantilevered girders, 139'-0-1/2" long, extend from each abutment to pin-and-hanger connections located 45'-0" past the intermediate piers. The cantilevered girders are haunched over the intermediate piers. From the pin-and-hanger connections, 54'-5-1/2"-long suspended girders cover the remaining distance to the bascule piers. Expansion joints occur in the deck directly over the pin-and-hanger connections. As part of a 1998 rehabilitation, the hangers were removed and replaced with bolted continuity splices between the cantilevered and suspended girders. This converted the approaches into two-span continuous girders, with new expansion joints at the abutments to accommodate longitudinal movement.[8]

The deck on the approach spans is supported by a system of floor beams and stringers similar to that on the movable leaf, except with an asphalt wearing surface laid over a reinforced

---

[6] "4 Loads of Junk Help Raise Bridge," *Philadelphia Record,* 13 June 1937.

[7] A. G. Lichtenstein and Associates, "University Avenue Bridge over the Schuylkill River: Mechanical and Electrical Inspection Report" (Langhorne, Pa., 15 Aug. 1990), 2, copy in bridge inspection file, BMS No. 67-3003-0050-0000, Pennsylvania Department of Transportation, Engineering District 6-0, St. Davids, Pa. (hereinafter cited as PennDOT Inspection File); cf. Department of Public Works, "University Bridge over the Schuylkill River: Machinery — General Plan," Drawing No. 12253 (Jan. 1927); ibid., "Steel Plan of Bascule Span."

[8] A. G. Lichtenstein and Associates, "University Avenue Bridge over Schuylkill River, City of Philadelphia, Pennsylvania: Determination of Effect Report" (Langhorne, Pa., May 1995), A-1, copy in PennDOT Inspection File.

concrete deck. The bridge's overall width is 73'-0", consisting of a 54'-0" roadway with 9'-6" sidewalks on either side. Original bronze railings, which repeated the chevron motif found elsewhere on the bridge, were replaced with an aluminum railing during a 1984 rehabilitation. Concrete safety barriers were installed between the roadway and sidewalks during the same project. Other work included repairs to the deck and an overhaul of the operating machinery.[9]

Brief History

From the first plans to its official opening, the University Avenue Bridge project consumed more than twenty-five years. The city made public an initial proposal to link South and West Philadelphia in May 1917. The city's Department of Public Works and Bureau of Surveys had developed a design that would have been one of the longest and most ornate bridges spanning the Schuylkill River, an extension of South 34th Street connecting Grays Ferry Avenue to a proposed parkway called University Avenue. Their vision included a double-leaf bascule span with a half-mile of high viaduct approaches. The viaducts were necessary to provide clearance over the river carry traffic across the Baltimore & Ohio Railroad tracks on the east bank and the Pennsylvania Railroad tracks on the west. The estimate for the entire project, including approaches and property acquisition, was $1 million.[10] Lack of funds and the intervention of World War I, however, kept the plans from materializing. During the interim, fervor had increased among city planners for a modern transportation network, and among civic leaders for a symbolic gateway to the University of Pennsylvania campus. More than eight years later, on 12 November 1925, the City Council finally passed an ordinance appropriating $1.3 million for the bridge.[11]

Even with funding in hand, the Department of Public Works had to negotiate a lengthy approval process before construction could begin. Chief Engineer John A. Vogelson and Bridge Engineer Steven H. Noyes developed the plans and specifications for the bridge. Vogelson, a Cornell University graduate, oversaw the mechanical design while Noyes supervised the structural work, in collaboration with consulting architect Paul Philippe Cret. They presented an initial design in April 1926, but this met with objections from Woodlands Cemetery and university officials. The city engineers revised their design, replacing a viaduct on the west approach with a tunnel under the Pennsylvania Railroad's tracks, reducing the bridge's length to its present 536'-0". Satisfied with the changes, representatives from commercial and civic organizations presented no objections at a public hearing on 19 July.[12] This was only a first step, however. The Schuylkill River was considered a navigable waterway and therefore under the

---

[9] Lichtenstein, "Determination of Effect," A-1; Steffe, "University Avenue Bridge," Section 7, p. 1.

[10] "Ornate Bridge Will Span the Schuylkill," *Philadelphia Inquirer*, 27 May 1917.

[11] "University Bridge Ordinance Passes," *Evening Bulletin* (Philadelphia), 12 Nov. 1925.

[12] "Plans Changed for Span Project," *Evening Public Ledger* (Philadelphia), 13 Jul. 1926.

jurisdiction of the U.S. War Department. The city applied in August for a construction permit, which the Secretary of War did not grant until 11 March 1927.[13] Approval from the Philadelphia Art Jury, mainly a test of Cret's architectural treatment, came two weeks later. Construction could finally proceed.

The construction contract negotiated in 1927 covered only the bridge, excluding the approaches that would tie it into the city's street grid. This fact is most strikingly presented in plans for the bridge, which show the roadway terminating abruptly atop short embankments at either end.[14] The city advertised for proposals on 24 May 1927, and received bids from six contractors. For its low bid of $1,288,625, the Dravo Contracting Company of Pittsburgh was awarded the contract on 9 June. Work began in October with excavation for caissons in the river bed. Through the early months of 1928, concrete was poured for the foundations. The pier masonry and steel superstructure rose quickly, and were completed ahead of schedule in December 1928. It had since become apparent that no funding existed to construct the approaches, leaving the bridge stranded.[15] Although it carried no traffic during its first four years, the bridge was usually kept in the closed position, with two operators on duty around the clock to open it for passing boats.[16]

A new city administration and a new Chief Engineer, John H. Neeson, strove to finish what their predecessors had not. The city's new convention center, scheduled to open in mid-1931, provided further impetus to complete the bridge. Even so, property acquisition, negotiations with the affected railroads, and political wrangling repeatedly delayed the construction of approaches to the bridge. The alignment of University Avenue was the subject of debate between the City Council and Department of Public Works in early 1930, stalling plans for the western approach. City officials reached agreement on a traffic circle at 39th Street and Woodland Avenue by August, and began negotiations with the Pennsylvania Railroad for an underpass. Plans for the simpler eastern approach over the Baltimore & Ohio Railroad tracks, in contrast, had already earned that railroad's stamp of approval in July.[17] Work on the underpass, overpass, and connecting streets proceeded throughout 1932. It required five separate construction contracts and brought the project's total cost to $1,596,000. Despite the city's repeated assurances that the bridge would be ready late that year, weather-related days pushed

---

[13] "Bridge Plans Appraised," *Evening Bulletin,* 19 Aug. 1926; "Approve Bridge Plans," *Evening Bulletin,* 12 Mar. 1927.

[14] Department of Public Works, "General Plan."

[15] "Hasten New Span, Approaches Wait," *Evening Bulletin,* 9 July 1928; Thomas C. Jester, "University Avenue Bridge, Philadelphia: An Historic Structure Report" (master's thesis, Univ. of Pennsylvania, 1991), 26-27.

[16] "Tenders of Unused Bridge Get Bored," *Evening Bulletin,* 29 Jan. 1930.

[17] "University Bridge Faces New Delay," *Evening Bulletin,* 22 Feb. 1930; "City Spurs Action for Completion of University Bridge, Idle 2 Years," *Evening Public Ledger,* 12 Aug. 1930; "Reach Agreement on Span Approach," *Evening Bulletin,* 8 July 1930.

the promised opening to January 1933, then to May. A formal dedication ceremony was held on 10 May, with the mayor and high-ranking public works officials in attendance.[18]

Architectural Treatment

Architecturally speaking, the University Avenue Bridge exhibits a stripped-down classicism as interpreted by Paul Philippe Cret (1876-1945), who served as architectural consultant on the project. By that time, Cret had built a reputation for advising on, if not actually designing, monumental structures including memorials, civic buildings, and bridges. He was educated at the École des Beaux-Arts, whose classical ideals were admired by proponents of the City Beautiful movement. The University of Pennsylvania offered him the professorship that brought him from Paris to Philadelphia in 1903. Cret subsequently served on the Benjamin Franklin Parkway Commission, designed the Frankford Memorial, and in 1922, consulted with engineer Ralph Modjeski on the Delaware River (Benjamin Franklin) Bridge. The Delaware River Bridge was not only Cret's first bridge project, but also happened to be the world's longest suspension span. The publicity it received made Cret's name, already well-known in the architecture community, familiar to engineers as well. This led to collaboration with Modjeski and his partner Frank M. Masters on bridges in Harrisburg, Philadelphia, Washington, D.C., and elsewhere. Desiring more of his work, Philadelphia officials tapped him to create the bridge they expected "would be one of the most artistic spans in the United States."[19]

For the University Avenue Bridge, Cret created an exterior that is monumental yet sparse in detail. Indiana limestone abutments, piers, and towers support, without overwhelming, the subtly arched steel plate girders. This was in accordance with his belief in "emphasizing [a bridge's] structural purpose instead of dissembling it." Of the University Avenue Bridge, he wrote that "the juxtaposition of steel members and masonry requires the greatest simplicity of treatment of the stone work, if one is to avoid a lack of unity in the composition."[20] The limestone piers therefore have a minimum of ornament. On the bascule piers, two tiers of round windows on the north and south faces mark the interior levels. Towers rising from the upstream (east) side of the bascule piers are plain rectangular shafts, with an octagonal colonnade set above deck level. Windows set between the columns on the southeast tower enclose the operator's house; a corresponding space in the northeast tower is a storage room. The colonnades support octagonal entablatures crowned with cylindrical drums. Opposite the towers,

---

[18] "Two New Bridges Open in October," *Evening Bulletin,* 28 Apr. 1932; "University Bridge May Open Soon," *Evening Public Ledger,* 4 Sep. 1932; "Weather Delays Bridge," *Evening Bulletin,* 28 Dec. 1932; "University Bridge Placed in Service," *Evening Bulletin,* 10 May 1933; Jester, "University Avenue Bridge," 26-27.

[19] Sandra L. Tatman and Roger W. Moss, *Biographical Dictionary of Philadelphia Architects: 1700-1930* (Boston: G. K. Hall & Co. for the Atheneum of Philadelphia, 1985), 172-75; Jester, "University Avenue Bridge," 11-14.

[20] Paul Philippe Cret, "Bridges," *Architectural Progress* 4, No. 11 (Nov. 1930): 8; cf. ibid., "The Architect as Collaborator with the Engineer," *Architectural Forum* 49, No. 1 (July 1928): 97-104.

on the downstream (west) side of each bascule pier, a sidewalk recess with two square limestone columns balances the composition. The columns support bronze lanterns, and are echoed by shorter columns at the four corners of the abutments. A chevron motif is repeated in carved friezes and moldings, bronze doors and railings, and other features throughout the structure.[21]

Conclusion

The University Avenue Bridge is a splendid example of the City Beautiful movement in Philadelphia applied to an important movable bridge type. It exemplifies the collaboration between engineering and architectural disciplines that profoundly affected bridge projects during an intense period of municipal improvement in Philadelphia. The complex mechanical and electrical systems of this double-leaf trunnion bascule bridge are enveloped beneath a refined limestone exterior expressed in the Moderne style. The bridge was one of several new Schuylkill River crossings planned during the 1920s, and became a key element in later transportation improvements intended to improve access between south and west Philadelphia. Its design was influenced by not only local politics, but also federal regulations protecting existing river traffic. Located in an active industrial area along the Schuylkill River, the University Avenue Bridge is a visual reminder of southwest Philadelphia's maritime history.

[21] For a more complete description of the architectural elements, see Jester, "University Avenue Bridge," or Steffe, "University Avenue Bridge."

SOURCES CONSULTED

Bowie, John, ed. *Workshop of the World: A Selective Guide to the Industrial Archeology of Philadelphia.* Wallingford, Pa.: Oliver Evans Press, 1990.

City of Philadelphia, Department of Public Works, Bridge Division. University Avenue Bridge construction drawings, Nos. 12209-12246. Compartment No. 1278, Department of Streets, Bridge Section.

City of Philadelphia, Department of Streets, Highway Division, Bridge Maintenance Unit. University Avenue Bridge maintenance records.

Cret, Paul Philippe. "The Architect as Collaborator with the Engineer." *Architectural Forum* 49, No. 1 (July 1928): 97-104.

_____. "Bridges." *Architectural Progress* 4, No. 11 (Nov. 1930): 6-8.

Evening Bulletin. Philadelphia, Pa.

Evening Public Ledger. Philadelphia, Pa.

Jester, Thomas C. "University Avenue Bridge, Philadelphia: An Historic Structure Report." Master's thesis, Univ. of Pennsylvania, 1991.

Pennsylvania Department of Transportation, Engineering District 6-0, St. Davids, Pa. Bridge inspection file, BMS No. 67-3003-0050-0000.

Philadelphia Inquirer.

Philadelphia Record.

Steffe, Michael J. "University Avenue Bridge," Philadelphia County, Pennsylvania. National Register of Historic Places Registration Form, 1994. U.S. Department of the Interior, National Park Service, Washington, D.C.

Tatman, Sandra, L., and Roger W. Moss. *Biographical Dictionary of Philadelphia Architects: 1700-1930.* Boston: G. K. Hall & Co. for the Atheneum of Philadelphia, 1985.

Urban Archives, Paley Library, Temple University, Philadelphia, Pa. University Avenue Bridge file.